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Title: SINGLE AXLE BOGIE FOR RAILWAY ROLLING STOCK OR RAILWAY CARS ;

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IPC Classification: B61H13/20 ;

Equivalents: JP59118566 ;

ABSTRACT:

The frame 1 of the bogie is supported by way of axle springs 4 on axle boxes 3 at opposite ends of wheel axle 2, and the bogie frame 1 supports, by way of springs 5, a car body 6; brake mechanism including brake cylinders 30, piston rods 31 brake levers 33 and brake blocks 37 is mounted entirely on the bogie frame 1 whereby the braking action does not influence the elastic action of springs 5, and the weight of the brake mechanism does not become a part of the unsprung weight so that the riding comfort is improved. The brake cylinders 30 are supported on opposite lateral sides of bogie frame 1; the brake levers 33 have their ends respectively pin connected to piston rods 31 and brake blocks 37 and at an intermediate part are pivotally supported on pivot pins 35 supported on a support member 40 adjustable in a fore-and-aft direction on the bogie frame 1. Rotation of the bogie frame 1 about axle 2 during braking is resisted by upper links 22; relative rotation of bogie and car body is restrained by linkage comprising side links 10, bell-crank levers 12 and cross-link 15.

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(54) Single axle bogie for railway rolling stock or railway cars

(57) The frame 1 of the bogie is supported by way of axle springs 4 on axle boxes 3 at opposite ends of wheel axle 2, and the bogie frame 1 supports, by way of springs 5, a car body 6; brake mechanism including brake cylinders 30, piston rods 31 brake levers 33 and brake blocks 37 is mounted entirely on the bogie frame 1 whereby the braking action does not influence the elastic action of springs 5, and the weight of the brake mechanism does not become a part of the unsprung weight so that the riding comfort is improved.

The brake cylinders 30 are supported on opposite lateral sides of bogie frame 1; the brake levers 33 have their ends respectively pin connected to piston rods 31 and brake blocks 37 and at an intermediate part are pivotally supported on pivot pins 35 supported on a support member 40 adjustable in a fore-and-aft direction on the bogie frame 1.

Rotation of the bogie frame 1 about axle 2 during braking is resisted by upper links 22; relative rotation of bogie and car body is restrained by linkage comprising side links 10, bell-crank levers 12 and cross-link 15.

FIG. 1

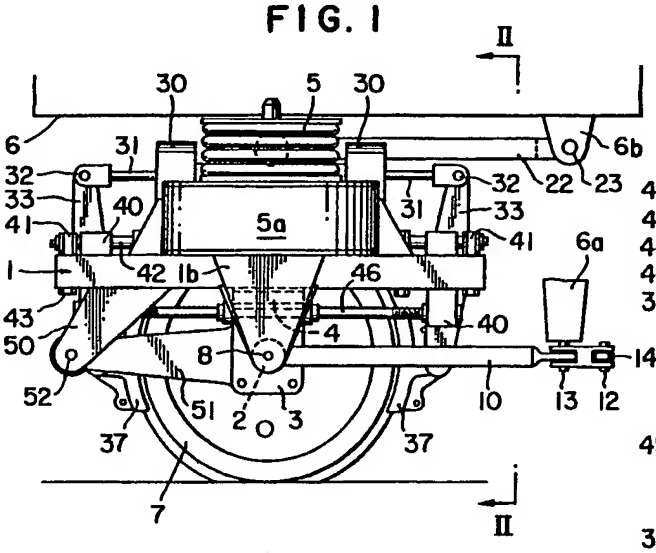

FIG. 3

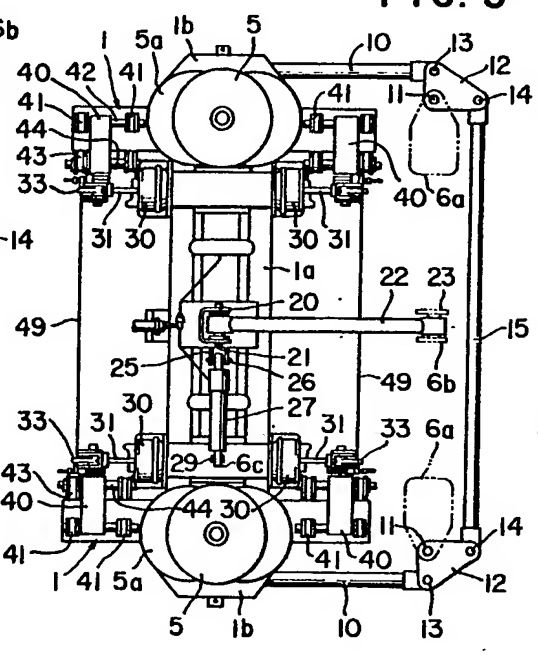

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FIG. 1

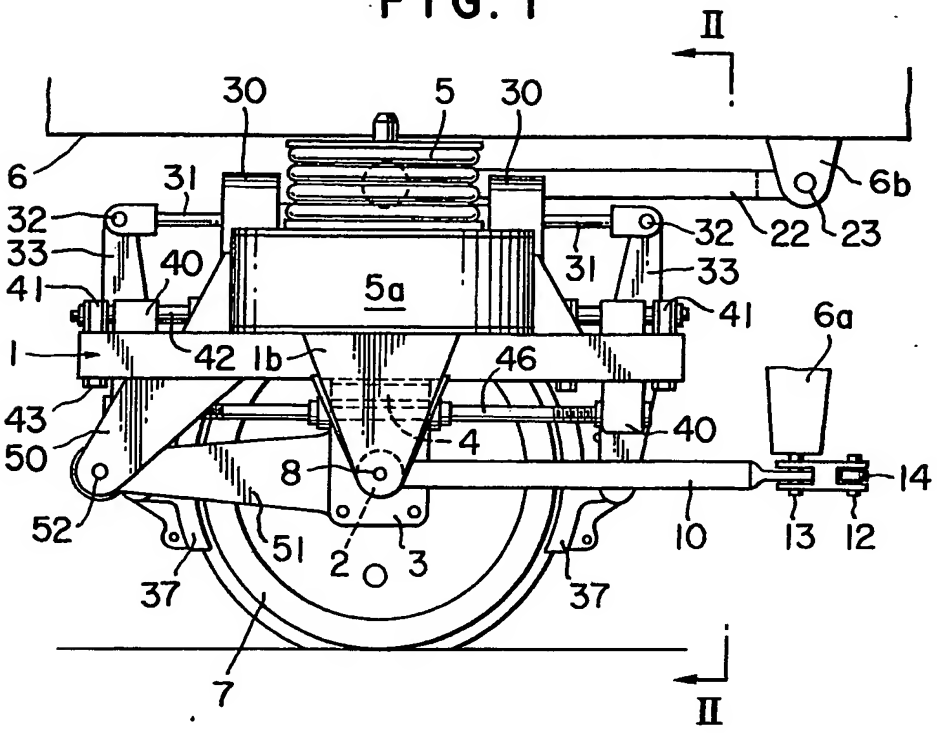


FIG. 2

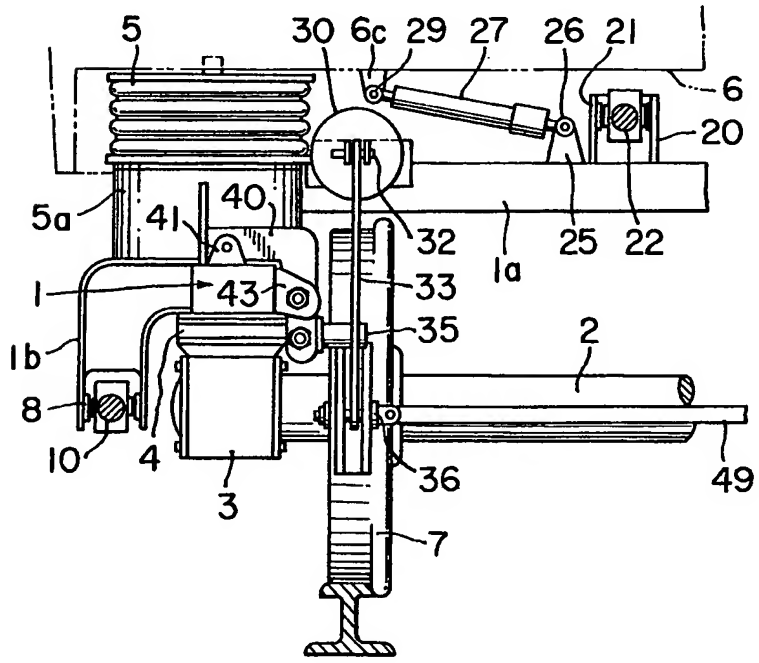
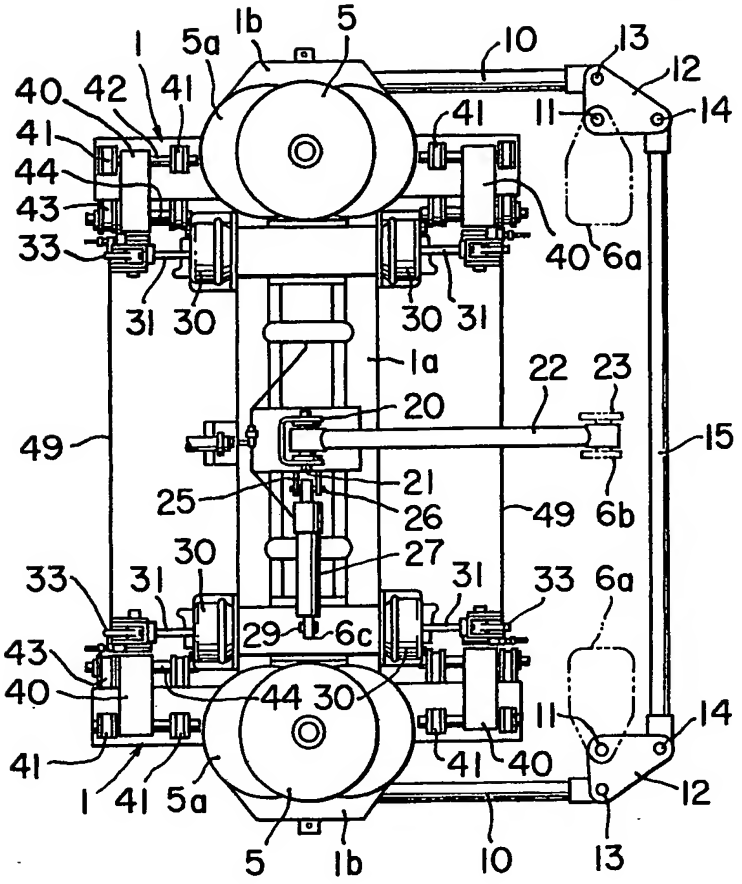


FIG. 3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5a
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1a
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6b
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6c
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10a
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FIG. 4

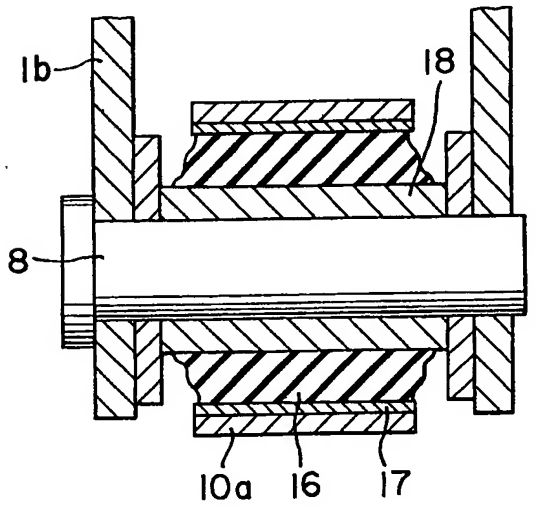
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FIG. 5

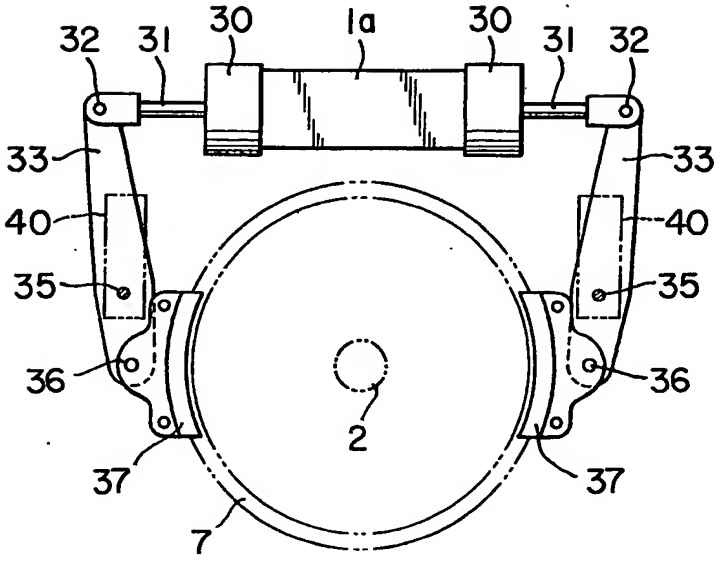
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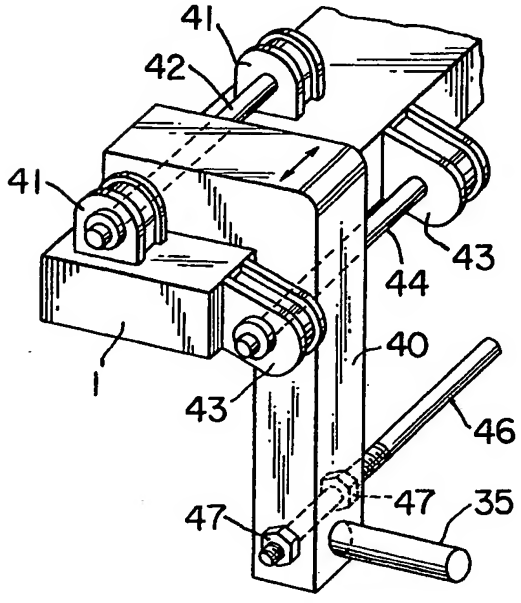
FIG. 6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SPECIFICATION

Single-axle bogie for rolling stock

This invention relates to a single-axle, or two-wheel, bogie for railway rolling stock or railway cars.

In a conventional single-axle bogie, the brake cylinders, brake levers, and other parts constituting essential parts of the brake system are supported on the car body (shell or framing), and at the time of braking, the brake levers are rotated about pivots supported on the car body, whereby brake blocks connected to the lower ends of the brake levers apply braking action to the wheels.

In a mechanical arrangement of this character, because of the force acting between the car body and the wheels at the time of braking, the elastic functions in the vertical and horizontal directions of the car body supporting springs provided between the bogie frame and the car body, and of the axle springs provided between the bogie frame and the axle boxes are nullified or greatly reduced, whereby there arises the problem of poor riding comfort of the car. Furthermore, when the bogie rotates relatively to the car body when traveling along a curve in the track, the wheels similarly rotate relatively to the brake mechanism supported on the car body, which imparts a deleterious effect on the braking action.

This invention provides a single-axle bogie in which the above described problems have been solved by a mechanical organization wherein the brake cylinders and the brake levers of the brake system are supported on the bogie frame.

According to this invention there is provided a single-axle bogie for railway rolling stock in which a bogie frame is supported at the lateral side parts thereof by way of axle springs on axle boxes enclosing the two ends of a wheel axle provided with wheels, and the bogie frame supports by way of car body supporting springs a part of a car body, characterized by a brake mechanism mounted entirely on the bogie frame and comprising brake cylinders with pistons and piston rods supported on the bogie frame on the opposite lateral sides thereof, brake levers pivotally supported at intermediate parts thereof on pivot pins supported on the bogie frame and pin connected at their one ends to the outer ends of respective piston rods, and brake blocks connected to the other ends of respective brake levers so as to be pressed against respective wheels in braking action.

The following is a description, by way of example, of one embodiment of this invention, reference being had to the accompanying drawings, in which:–

Figure 1 is a side elevation of the single-axle bogie of this invention;

Figure 2 is an elevational view taken in the plane indicated by line II–II in Fig. 1 as viewed in the arrow direction;

Figure 3 is a plan view of the same bogie;

Figure 4 is a relatively enlarged partial view, with parts shown in vertical section, showing a pivotal joint part at one end of a side link;

Figure 5 is a side elevation showing only the brake mechanism associated with one wheel; and

Figure 6 is a relatively enlarged partial perspective view showing the supporting structure of an adjustable support member for supporting the pivotal shaft of a brake lever.

The bogie shown in the drawings has a bogie frame 1 which, as is known, is supported by way of axle springs 4 on axle boxes 3 at opposite ends of a wheel axle 2 integrally fixed to wheels 7. The car body (frame or shell) 6 is supported by way of car body supporting springs 5 on the bogie frame 1. The supporting springs 5 are respectively provided on the lateral (left and right) sides of the bogie frame as shown in Fig. 3. Furthermore, each car body supporting spring 5 comprises an air spring or some other elastic structure and has at its base portion a part 5a constituting a pneumatic damper.

The bogie frame 1 comprises essentially two parallel side members extending in the fore-and-aft direction on respective lateral sides of the bogie, a transverse cross beam 1a joining the two lateral members, and brackets 1b projecting laterally outwards respectively from the two lateral members and then downwards.

To the lower extremity of each bracket 1b is pivotally connected one end of a side link 10 by a pin 8. The other end of each link 10 is pin jointed by a pin 13 to the outer end of one arm of an L-shaped crank or bell-crank lever 12 which is pivotally connected to a support member 6a on the car body as shown in Fig. 3. The outer end of the other arm of the bell-crank lever 12 is pin connected by a pin 14 to one end of a transverse tie rod or crosslink 15, the other end of which is similarly pin connected by another pin 14 to the outer end of the corresponding arm of the bell-crank lever 12 on the opposite lateral side.

In the above mentioned pin connection between one end of each side link 10 and the lower extemity of the bracket 1b, that end 10a of the side link 10 is of annular shape as shown in Fig. 4, and, between the pin 8 and this annular end 10a, there are interposed a bush 18 rotatably fitted around the pin 8, an elastic sleeve 16 fitted securely around the bush 18, and a bush 17 fitted fixedly around the elastic sleeve 16 and press-fitted in the annular end 10a. Thus a certain degree of freedom of relative movement is imparted to this pin connection.

On the cross beam 1a of the bogie frame 1, at the middle part thereof, a shaft support member 20 is fixed and projects upwards as shown in Figs. 2 and 3. One end of an upper link 22 is pin connected by a pin 21 to this shaft support member 20. The other end of this upper link 22 is pin connected by a pin 23 to a bracket 6b supported on the car body. The pin connection with the pin 21 between one end of the upper link 22 and the support member 20 has the same construction featuring an elastic sleeve as that shown in Fig. 4, a certain degree of freedom in movement thereby being imparted to the connection.

Also on the cross beam 1a of the bogie frame 1, a bracket 25 is fixedly provided and projects upwards. One end of a hydraulic (oil) damper 27 is pin connected by a pin 26 to this bracket 25. The other end of the damper 27 is pin connected by a pin 29 to a bracket 6c supported on the car body. As shown in Figs. 2 and 3, this hydraulic damper 27 is aligned in the transverse direction of the bogie frame 1.

As best shown in Fig. 3, brake cylinders 30 are fixedly mounted in fore-and-aft direction respectively on opposite lateral sides on the upper part of the bogie frame 1. The two brake cylinders 30 on one lateral side have respective piston rods 31 respectively projecting outwardly forwards and rearwards. The outer end of each piston rod 31 is pin connected by a pin 32 to the upper end of a brake lever 33. As shown in Fig. 5, each brake lever 33 is pivotally supported at an intermediate part thereof by a pivot pin 35 and is pin connected at the lower end thereof by a pin 36 to a brake block 37.

The above described mechanism is of symmetrical configuration relative to its corresponding wheel 7 and is so adapted that, at the time of braking, the two brake blocks 37 are pressed against the tread of the wheel 7 at approxiamtely diametrically opposite parts thereof with substantially equal force exerted by the brake cylinders 30 and transmitted therefrom through the piston rods 31 and the brake levers 33 to the brake blocks 37.

The pivot pin 35 of each brake lever 33 is fixedly supported on the lower end of an L-shaped adjustable support member 40 as shown in Fig. 6 and is thus held to project horizontally towards the inner side of the bogie as shown in Fig. 2. Each adjustable support member 40 is in turn slidably supported on two spaced-apart guide rods 42 and 44 extending parallel in the fore-and-aft direction and supported on a respective side member of the bogie frame 1 at a respective end thereof. The guide rod 42 is supported on and extends between two brackets 41 fixed to the upper face of the side member of the bogie frame 1, and the guide rod 44 is supported and extends between two brackets 43 fixed to the inner face of the same side member. Thus, each adjustable support member 40, supporting its pivot pin 35, is adjustably slidable in the fore-and-aft direction.

The two fore-and-aft adjustable support members 40 on the same side member of the bogie frame 1 are connected by a connecting rod 46 passed through holes therein and having screw threads formed on at least one end thereof. By turning nuts 47 screw-engaged with the threaded end of the connecting rod 46 on opposite sides of one of the support members 40, the spacing distance between the above mentioned two suppot members 40 (and therefore their pivot pins 35) can be adjusted and set.

The opposed pins 36 of the brake mechanisms on opposite sides of the bogie frame 1 at the front and rear thereof are respectively connected by tension rods 49 as shown in Figs. 2 and 3.

As shown in Fig. 1, a strut 50 is fixed to the lower part of each side member of the bogie frame 1 at its end remote from the aforedescribed crosslink 15 and extends obliquely downwards and away from the wheel axle 2. This strut 50 is pin connected at its outer end by a pin 52 to the outer end of an arm 51 fixed at its base end to the table box 3 and extending substantially horizontally away from the crosslink 15.

At the time of braking in the bogie of the above described mechanical constitution, the four brake cylinders 30 operate in unison to thrust outwards their piston rods 31, thereby rotating the brake levers 33 about their pivot pins 35 to press their brake blocks 37 against the wheels 7. During this action, forces arising from this braking action do not act on the car body supporting springs 5 because the brake cylinders 30, the brake levers 33, and other related parts of the brake mechanism are all supported on the bogie frame 1. For this reason, there is no effect on the elastic action in the vertical direction and the horizontal direction of the car body supporting springs 5, and there is no possibility of the riding comfort becoming poor. Another benefit arising from this construction wherein the entire brake mechanism is supported on the bogie frame 1 is that the weight of the brake mechanism does not become a part of the unsprung weight, whereby the impact imparted to the rails is small, and the riding comfort is good.

As is known, when the car passes through a curve in the track, each bogie must rotate about a vertical axis relative to the car body. This means that the wheels of each bogie similarly rotate relative to the car body. If, in this case, the brake mechanism is supported by the car body, relative rotation will undesirably occur also between the brake mechanism and the wheels. In the bogie of this invention, however, since the brake mechanism is sup-

ported on the bogie frame, there is no possibility of such an undesirable relative rotation occurring.

The above mentioned relative rotation of the bogie and the car body at the time when the car is passing through a curved portion of the track takes place under restraint due to a linkage comprising the side links 10, the bell-crank levers 12, and the crosslink 15, and the left and right wheels 7 and axle boxes 3 turn left or right in synchronous angular movement of the same quantity due to the intercoupling action of the linkage. Furthermore, this linkage functions also to cause coincidence between the centre of rotation of the bogie and the centre of the bogie.

In the case of a single-axle bogie, the bogie structure other than the wheels and the axle tends to rotate about the axle as a consequence of a moment due to the braking force at the time of braking. A moment of this character is resisted by the upper link 22, whereby the above mentioned rotation of the bogie structure is prevented. More specifically, in the case where the bogie structure is subject to a moment tending to rotate it, for example, in the clockwise direction as viewed in Fig. 1, the upper link 22 is subjected to a compressive force since it is connected to and supported by the bracket 6b relative to the car body. At the same time, the reactive force of the rails acting on the wheels tends to move the bogie towards the left as viewed in Fig. 1 relative to the car body. This movement is resisted and prevented by the side links 10, which are connected by the support members 6a to the car body and are subjected to tensile force.

It is also possible to prevent the above mentioned rotation of the bogie structure by interposing springs in spaced-apart relation in the fore-and-aft direction between the upper surface of the bogie frame at the front and rear ends thereof and the car body. In this case, however, stiff springs must be used, whereby the riding comfort in the up-and-down direction is impaired. In contrast, by preventing the rotation of the bogie structure by means of the upper link 22 and the side links 10 according to this invention, springs affording optimum riding comfort in the up-and-down direction of the car can be provided.

Relative rotation in the horizontal plane between the car body and the bogie is resisted by the lateral rigidity of the car body supporting springs 5, and snaking motion or yawing oscillation is prevented. The car body supporting springs 5 and the axle springs 4 also have the function of absorbing and damping vibrations in the fore-and-aft, up-and-down, and side-to-side directions.

Furthermore, the elastic sleeves around the pin 21 of one end of the upper link 22 and the elastic sleeves 16 around the pins 8 of the sidelinks 10 also have the function of damping vibrations in the fore-and-aft direction. In addition, damping of vibrations in the side-to-side direction is accomplished also by the hydraulic damper 27.

Thus, riding comfort is greatly improved by the several damping means described above.

The aforedescribed tension rods 49 have the function of resisting the tendency of the brake blocks 37 to shift outwards at the time of braking. The structure comprising the strut 50, the arm 51, and the pin 52 connecting the strut and the arm functions to restrain relative displacement of the axle and the bogie frame in the fore-and-aft direction.

CLAIMS

1. A single-axle bogie for railway rolling stock in which a bogie frame is supported at the lateral side parts thereof by way of axle springs on axle boxes enclosing the two ends of a wheel axle provided with wheels, and the bogie frame supports by way of car body supporting springs a part of a car body, characterized by a brake mechanism mounted entirely on the bogie frame and comprising brake cylinders with pistons and piston rods supported on the bogie frame on the opposite lateral sides thereof, brake levers pivotally supported at intermediate parts thereof on pivot pins supported on the bogie frame and pin connected at their one ends to the outer ends of respective piston rods, and brake blocks connected to the other ends of respective brake levers so as to be pressed against respective wheels in braking action.

2. A single-axle bogie according to claim 1 in which the pivot pins of the brake levers are adjustably displaceable in the fore-and-aft direction of the bogie frame relative thereto.

3. A single-axle bogie according to claim 1 in which the pivot pins of the brake levers are fixed to and project from respective adjustable support members supported on the bogie frame in a manner permitting adjustable displacement of said adjustable support members in the fore-and-aft direction of the bogie frame relative thereto.

4. A single-axle bogie according to claim 3 in which each of said adjustable support members comprises a part displaceably mounted on the bogie frame, and another part extending downwards from said part and fixedly carrying one of the pivot pins of the brake levers.

5. A single-axle bogie according to any of the preceding claims, further having an upper link disposed substantially in the horizontal and fore-and-aft direction of the bogie frame and connected at one end to the bogie frame and at the other end to a part of the car body, said upper link functioning to restrain rotational displacement of the bogie frame about the wheel axle relative to the car body at the time of braking.

6. A single-axle bogie according to any of the preceding claims, further having, on each lateral side of the bogie frame, a structure comprising a strut fixed to the bogie frame at an end thereof in the fore-and-aft direction thereof and extending downward, and an arm fixed at its base end to the axle box on the same lateral side and extending substantially horizontally away from said axle box, and a pin which connects the outer end of the strut and the other end of the arm said structure functioning to restrain relative horizontal displacement of the wheel axle and the bogie frame.

7. A single-axle bogie for railway rolling stock substantially as hereinbefore described with reference to and as illustrated in the figures of the accompanying drawings.

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